

MEDICINE (FACULTY BASED COURSES)**INTRODUCTION**

All medicine graduate programs may require from their students to study the following Faculty Based Courses. These courses may be considered compulsory for some programs and electives for the others.

0500-501	Basic Molecular Biology	(1)
0500-502	Basic Immunology	(1)
0500-503	Research Communication I	(1)
0500-504	Research Communication II	(1)

COURSE DESCRIPTION

0500-501: BASIC MOLECULAR BIOLOGY
CR: 1

Nucleic acid structure and functions; DNA analysis by agarose gel and DNA sequencing; DNA Replication: Mechanism, Regulation, Differences between prokaryotic and eukaryotic process; DNA damage, repair and mutagenesis, and diseases associated with defective repair; Transcription mechanisms and processing of primary RNA; The genetic code, protein synthesis and regulation; Restriction and modification enzymes and their importance in molecular biology.

0500-502: BASIC IMMUNOLOGY
CR: 1

Introduction to immunity, Innate and acquired immunity, Organs and cells of the immune system, the Major Histocompatibility Complex and its role in antigen presentation, Humoral immunity, antibodies and complement, Cell-mediated immune function T cells and macrophages, Cytokines and their roles in immune responses, Transplantation immunology, immunoprophylaxis and immunotherapy, Autoimmunity and autoimmune diseases, Hypersensitivity

500-503: RESEARH COMMUNICATION I
CR: 1

The aim of this course is to improve the student's ability to locate and retrieve information in the library, take effective notes, recognize and manipulate biomedical word roots and affixes of classical origin, write scientific English and communicate effectively in seminars. The course has the following components, which are designated to achieve this aim: Library skills, biomedical terminology, basic information structure, processing and seminar skills.

0500-504: RESEARH COMMUNICATION II
CR: 1

This course has its emphasis on improving the student's ability to collect and organize relevant information, and then communicate that information effectively for research reporting purposes, whether as a written report or a seminar presentation. The timing of the course is contrived to oblique the student to present his thesis background and methods in a seminar.

MEDICINE (GENERAL COURSES)**INTRODUCTION**

All Medical graduate programs require the study of one or more of the following courses offered by the **Department of Community Medicine and Behavioral Sciences**.

0510-501	Biostatistics and Computer in Medicine	(2)
0510-502	Advanced Biostatistics	(1)
0510-503	Epidemiology	(1)
0510-504	Radiotracer Methodology in Biological Research	(2)
0510-601	Biostatistical Method in Medical Research	(3)
0510-602	Epidemiology of Infectious Diseases	(3)

COURSE DESCRIPTION**0510-501: BIOSTATISTICS AND COMPUTER IN MEDICINE****CR: 2**

This is a 2 credit hour faculty-required course intended for students joining the graduate M.Sc. program in the Faculty of Medicine, Kuwait University. The course takes into account the fact that enrolled students belong to various backgrounds and hence it includes a diversity of topics to meet their interest. The course is characterized by the inclusion of statistical methods in epidemiology (relative risk, odds ratio to measure the association between diseases and factors, evaluation of diagnostic tests), determination of size of investigations and power, analysis of variance, and design of controlled randomized clinical trials. It also includes multivariate statistical methods such as multiple linear regression and binary multivariable logistic regression. It focuses on concepts, limitations, validity and assumptions underlying these statistical methods.

The course also provides students with knowledge about hardware and software computer technology in addition to the skills of applying the procedures of the SPSS statistical package, and information about computer uses in medicine

(hospital information system, drug information system and computer-assisted diagnoses).

0510-502: ADVANCED BIOSTATISTICS**CR: 1**

Planning of statistical investigation. Controlled comparative studies: Clinical and simple comparative trials, two period cross over design. Analysis of variance. Experimental design. The control of misclassification error. Survivorship tables and life tables. Biological assays: Parallel-line, slope ratio and quantal response. Non-parametric statistics: One-sample run test, Mann-whitney test, Kruskal-Wallis analysis of variance, and Kendall rank correlation.

0510-503: EPIDEMIOLOGY**CR: 1**

Scope of epidemiology, basic measures of frequency, sources of morbidity data, direct and indirect standardization. Planning of an epidemiological investigation, survey planning, variability of measurements, validation and problems in validation, measurement of experimental error, population screening and disease control.

**0510-504: RADIOTRACER METHODOLOGY
IN BIOLOGICAL RESEARCH
CR: 2**

This course provides an introduction to the principles and procedures underlying the use of radioactive isotopes in biological research. The material will be presented at a level requiring only elementary mathematics and the principles and procedures will be illustrated with practical examples drawn from actual laboratory work. The course begins with the materials, and detection and measurement of radiation, and progresses to discussions and illustrations of the applications and problems of radiation measurement and experimental design in biology and medicine and methods used for reduction of radiation exposure. Hazards associated with the use of radioactive material will be discussed. Topics which will be given special emphasis include Gamma and Beta counting of biological samples autoradiography, radiochromatography, use in life science and clinical research, and radiation safety measures.

**0510-601: BIOSTATISTICAL
METHODS IN MEDICAL
RESEARCH
CR: 3 PR: 0510-501 or its equivalent.**

The course primarily aims at equipping students with tools of research. This includes univariate statistical methods update, sampling methods and sample size, experimental design, multivariate

analysis, logistic regression, survival analysis: clinical trials, statistical methods in epidemiology, analysis of matched data and nonparametric statistics. Mann-Whitney, Wilcoxon paired test, Kruskal-Wallis and Spearman rank correlation.

**0510-602: EPIDEMIOLOGY OF
INFECTIOUS DISEASES
CR: 3**

Concepts and definitions, epidemiological models, causality, epidemic process, indices of health and disease, natural history of infectious diseases, contact patterns, measuring infectivity, methods and techniques for studying an infection in the community, time and place clustering, use of routinely collected data, special surveys, surveillance of infectious diseases, field investigation, analysis of an outbreak, seroepidemiology, the effect of bias, confounding and misclassification on the identification of source/reservoir of infection and mode of transmission, statistical techniques often used in infectious disease epidemiology, mathematical models for epidemics, primary and secondary prevention in the infectious disease epidemiology, epidemiology of vaccination, control, elimination and eradication, epidemiology of emerging infections and epidemiology of specific infectious diseases.

MASTER OF SCIENCE BIOMEDICAL SCIENCES

INTRODUCTION

The Faculty of Medicine offers a part-time master program in **Biomedical Sciences**. The aim of this program is to provide top medical students with opportunity for advanced training and to gain research experience in basic medical sciences in parallel with their professional training in order to facilitate their development as physician-scientists.

According to the University Council decision dated 4/2/2007, Thesis students admitted with effect from September 2007 are exempted from the comprehensive examination.

PROGRAM REQUIREMENTS

30 TOTAL COURSE CREDITS

11 COMPULSORY (Credits in parenthesis)

0500-501	Basic Molecular Biology	(1)
0510-502	Advanced Biostatistics	(1)
0530-535	Integrative Physiology	(2)
0540-501	Biochemistry of Cell Organelles	(2)
0540-563	Metabolic Homeostasis and Abnormalities	(3)
0550-505	Molecular Pharmacology	(2)

10 ELECTIVES (Credits in parenthesis)

0530-521	Experimental Physiology*	(1)
0530-532	Selected Topics in Cellular Physiology	(1)
0530-534	Selected Topics in Pathophysiology	(1)
0530-552	Fluids, Electrolytes and Acid Base Physiology	(3)
0530-571	Selected Topics in Physiology 1	(1)
0540-560	Biochemical Techniques I*	(3)
0540-561	Biochemical Techniques II*	(3)
0540-564	Biochemistry of Diseases	(3)
0540-565	Hormone Biochemistry	(2)
0540-567	Membrane Biochemistry and Biophysics	(2)
0550-504	Experimental Techniques in Pharmacology*	(3)
0550-519	Advanced Topics in Pharmacology 1	(3)
0560-506	Tissue and Organ Histology	(2)
0560-523	Seminars in Advanced Cell Biology	(1)
0570-502	Basic Laboratory Medicine*	(4)
0570-506	Immuno-Pathology	(2)
0545-526	Advanced Microscopical Methods*	(2)

0545-527	Research in Neuroscience	(2)
0545-528	Tissue Culture*	(2)
0545-529	Ultrastructure and Surface Morphology	(2)

*At least one of the electives has to be completed (according to the student's research interest and area of research).

9 COMPULSORY

0545-597	Thesis	(0)
0545-598	Thesis	(0)
2000-599	Thesis	(9)

COURSE DESCRIPTION

0500-501: BASIC MOLECULAR BIOLOGY

CR: 1

Nucleic acid structure and function; DNA analysis by agarose gel and DNA sequencing; DNA replication: mechanisms and regulation. Differences between the prokaryotic and eukaryotic cells. DNA damage repair and mutagenesis. Diseases associated to defective repair of DNA. Transcription processes and mechanisms; processing of primary RNAs. The genetic code, proteins synthesis and regulation. Restriction and modification enzymes and their importance in molecular biology.

0510-502: ADVANCED BIOSTATISTICS

CR: 1

Statistical power and sample size determination, Design and analyses of controlled randomized clinical trials, Analyses of variance, Generalized linear models, Analyses of binary outcomes, Survival analyses.

0530-521: EXPERIMENTAL PHYSIOLOGY

CR: 1

Each student is assigned to individual staff member for an intensive study of all facts of a research project including conception, literature research, experimental techniques and construction of scientific reports.

0530-532: SELECTED TOPICS IN CELLULAR PHYSIOLOGY

CR: 1

This course is aimed to cover specific topics in cellular physiology as an addition to the topics covered in the "Tissue structure & cellular physiology" course. It mainly focuses on the specific important topics of the cellular function. Therefore, it might also be suitable for students with the main focus on cellular/molecular biology. This course should further expand student's knowledge of cellular processes. Course consists of 10 small group teaching sessions in the form of tutorials and of one practical (demonstration). In each session the instructor will discuss various aspects of cellular function or carry out experimental demonstration.

0530-534: SELECTED TOPICS IN PATHOPHYSIOLOGY

CR: 1

This course is scheduled for M.Sc. students in Physiology and other graduate students, assuming that they have completed the "Tissue structure and cellular physiology" course which is offered in the semester 1 of the M.Sc. program or its equivalent. The main goal of this course is to introduce students to main concepts in pathophysiology and the effects of failures of homeostasis. It will consist of small group teaching sessions. The course will run, as much as possible, in parallel with the "Systems physiology" course.

0530-535: INTEGRATIVE PHYSIOLOGY

CR: 2

This course takes homeostasis and environmental physiology a major themes. It is aimed for the graduate students who already successfully completed courses "Tissue structure and cellular physiology" and "Systems physiology". Lecture material ranges from cellular processes to the whole organism and interactions with the environment. The course includes consideration of a constant internal milieu, thermal balance, the problems posed by extreme environments and exercise physiology.

0530-552: FLUIDS, ELECTROLYTES AND ACID-BASE PHYSIOLOGY

CR: 3

An advanced course in the principles underlying the regulation of body fluids, electrolytes and acid-base balance.

0530-571: SELECTED TOPICS IN PHYSIOLOGY 1

CR: 1

An advanced course on topics in Physiology where integration of various areas is required or where a variable degree of emphasis is required for a topic. Representative topics may include neonatal physiology, thermal regulation, special senses, growth, development and aging, connective tissue and skin.

0540-501: BIOCHEMISTRY OF CELL ORGANELLES

CR:2

Integrative discussions of the modern techniques used for study of the cell, cell architecture and organelles, biogenesis of organelles, cell vesicular transport and signaling, cell division, apoptosis and aging, structure biology of the cell, and stem cell and cell abnormalities. Features include lectures, workshops and project presentations.

0540-560: BIOCHEMICAL TECHNIQUES I

CR: 3

Theories and practical-preparative biochemistry – fractional/centrifugation, dialysis/basic enzyme activity.Determination.Electrophoresis/blotting/iso electric focusing. Spectrophotometry-UV/ visible and fluorescence measurements. Computational application and biochemical information. Theories

only:Gc/Ms,Lc/Ms,IR/NMR/EPR/Ramanspectrophotometry. Circular dichroism/X-RAY diffraction, R-HPLC, and mass spectrometry.

0540-561: BIOCHEMICAL TECHNIQUES II

CR: 3

Theories and practicals: Molecular biology sequencing/DNA and RNA isolation/Plasmid transformation/Gene expression and analysis. Animals – small animals handling/Induction of diabetes and colitis in animals. Cell biology-Microscope application/Mitochondrial respiration/Basic cell cultural, Radiochemistry-Radiochemical handling/Radioimmunoassay. Peptide and Oligonucleotides synthesis. Theories only: Specialized animal models-Transgenic animals/Gene knockout animals. Specialized techniques-Flow cytometry/Patch clamp/Nanotechnology/membrane potentials.

0540-563: METABOLIC HOMEOSTASIS AND ABNORMALITIES

CR: 3

Thermodynamics in biological system. Acid and base homeostasis-Roles of kidney, liver and exercising skeletal muscle/Acidosis and alkalosis. Metabolic states-Fed or absorptive state/Fasting state/Obesity/Anorexia nervosa. Metabolic control mechanisms-Allosteric inhibition/Covalent modifications/ Modulation of enzyme turnover. Trace elements – Role as nutrients/Clinical deficiency and toxicity. Free radicals and cellular defense system.

0540-564: BIOCHEMISTRY OF DISEASES

CR: 3

Disorders of carbohydrate/Diabetes /Glycogen storage diseases /Galactosemia, Disorders of lipids and plasma lipoproteins-Adrenoleukodystrophy/ Familial cholestasis / Hypercholesterolemia / Hyperlipidemia, Disorders of proteins, peptides and amino acids-Alzheimer's disease/ Phenylketonuria / Cystinuria, Disorders of minerals and vitamins-Bone disorders/Vitamin deficiencies, Neurodisorders-Lesch Nyhan Syndromes / Parkinson's disease/Epilepsy/Migraine /Spongiform encephalopathy, Inflammation – Role of prostaglandins/anti-inflammatory substances, Cancer biochemistry and molecular biology, Xenobiotics-Role of cytochrome P450s.

0540-565: HORMONE BIOCHEMISTRY**CR: 2**

Stress and hormonal reactions, Sex hormones, Effects of glucagon and insulin on glucose metabolism, Peptide hormones and growth factors, Hormone receptors and receptor super families, Intracellular signaling systems, Nitric oxide and prostaglandins in various diseases.

0540-567: MEMBRANE BIOCHEMISTRY AND BIOPHYSICS**CR: 2**

An advanced lecture course covering selected areas in membrane biochemistry and biophysics. A flexible teaching structure will permit detailed coverage of special topics of current interest using seminar and tutorial formats as well as lectures on more general topics.

0550-504: EXPERIMENTAL TECHNIQUES IN PHARMACOLOGY**CR: 3**

This course provides basic training in the following: Solutions: Drug and physiological solutions, drug concentrations, preparation and storage of drugs. Experimental animals: Handling of animals, anaesthesia and surgery, routes of administration, artificial respiration. Bioassay: Principles of measuring muscle contractions, isotonic, isometric, auxotonic; recording blood pressure. Behavioral techniques: Animal activity meters, stereo tactic surgery. Recording techniques: Electronic Recording systems. Laboratory reports: Recording of results and experimental data. Management and handling of laboratory equipment. Analytical techniques: Gas Chromatography (GC), High performance Liquid Chromatography (HPLC), Gas Chromatography-Mass-Spectrometry (GC-MS), Molecular Biology Techniques.

0550-505: MOLECULAR PHARMACOLOGY**CR: 2**

This course deals with the molecular characterization of interactions between drug molecules and receptors or other macromolecular targets in cells, as well as how chemical structure correlates with biological activity. It also deals with how cells receive, transmit and respond to external signals from hormones, transmitters and pharmacological agents, and how molecular biology techniques are utilized to study these

events. The first part of the course introduces students to the latest advances in molecular pharmacology, namely pharmacogenomics, bioinformatics, proteomics, micro-array technology, gene silencing technology and their applications in pharmacological research. Subsequently, the course deals with the classical aspects of receptor pharmacology, including theories of drug-receptor interactions, measurement of agonist dissociation constant, and receptor antagonism. Other areas covered include various signal transduction pathways, identification of signaling molecules as drug targets and the principles of drug design and development.

Modes of delivery will include traditional lectures, linked tutorials based on published papers, as well as presentations by students of relevant topics.

0550-519: ADVANCED TOPICS IN PHARMACOLOGY 1**CR: 3**

This course covers important topics from three areas of Pharmacology, namely the Cardiovascular, Neuro and Endocrine areas. Within each area teaching will take an integrated approach and where possible integration across the systems or areas will also be undertaken. This course will build on, and deal with the advanced aspects of, the materials already covered in the Principles of Pharmacology I & II (500 & 501) courses. In the Cardiovascular section, topics to be covered include the physiology of the heart and the vascular systems, pathophysiology and drug treatment of a number of cardiovascular disease states, including hypertension, heart failure, hyperlipidaemias and angina pectoris. Novel and potential therapeutic targets as well as pharmacogenomic approaches to the identification of new targets will be discussed.

The endocrine component will cover the hormones of the anterior pituitary, the feedback control mechanisms of hormone secretion, pharmacology of insulin and insulin resistance as well as the thyroid and anti-thyroid drugs. The Neuropharmacology section will cover central and peripheral pain systems and their control, opioid and non-opioid analgesics, anti-psychotics and antidepressants as well as anti-Parkinson drugs.

0560-506: TISSUE AND ORGAN HISTOLOGY
CR: 2

The human anatomy at the microscopic level starts in this course with the study of the microscopic structure and characteristic features of the basic tissues that constitute the body organs and systems. This is followed by the study of the microscopic organization of the organs and systems that gives each of them their peculiar features relevant to their gross appearance and function. In addition to the lecture sessions, practical sessions are conducted on conventional light and electron microscopic preparations. This course is essential for future anatomical research and may provide basis for studies in histopathology.

0560-523: SEMINARS IN ADVANCED CELL BIOLOGY
CR: 1

This course is designed to provide students with an active learning environment in which multidisciplinary research articles are chosen by faculty members and students. The focus of this course is on encouraging students in self-learning and developing a critical thinking. Students are required to prepare, discuss and criticize research or review articles. The course will enable students to interact amongst themselves, integrate the knowledge and develop new independent thinking and ideas. Students will be exposed to a variety of research topics and techniques through published scientific articles.

0570-502: BASIC LABORATORY MEDICINE
CR: 4

Preparation of biological material for histopathologic analysis; principles of staining technology, conventional staining methods for nucleic acids, proteins, lipids, glycogen, enzymes and inorganic substances. Morphometric methods, principles of cytochemistry. Immunocytochemical methods, principles and applications of ultra structural techniques. Solutions and buffers; spectrophotometry and centrifugation; chromatography & electrophoresis; radioisotope tracer techniques; principles of mechanization and automated analysis. Blood cell count, manual and electronic, principles and practice. Haemoglobinometry, red cell indices, principles, sources of errors, critical appreciation of the system and their uses; study of red cell stability, integrity and functions; conventional techniques

for identification of abnormal haemoglobins and thalassaemias, blood groups and immuno-haematological techniques, morphology of blood and bone marrow cells, laboratory approach to the disorders of blood coagulation, haemostasis and thrombosis quality control in haematology.

0570-506: IMMUNO-PATHOLOGY
CR:2

The application of specific polyclonal and/or monoclonal antibodies for studies of cell growth and function in experimental systems and in human diseases.

0545-526: ADVANCED MICROSCOPICAL METHODS
CR: 2

Theoretical background and practical experience in a variety of microscopical techniques commonly used in studying cell biology. Advances made in microscopical techniques will be covered with emphasis on the advantages and limitations of each technique. The use of microscopy in characterizing normal cells and tissues will be examined. A variety of topics will be covered including: light microscopy, histochemistry, immunohistochemistry, fluorescence microscopy, confocal microscopy, in situ hybridization, radioautography and morphometry.

0545-527: RESEARCH IN NEUROSCIENCE
CR: 2

Areas in up-to-date neuroscience research with specific emphasis on anatomical approaches. The course will discuss latest advances and techniques in several major research topics in neuroscience such as:

- Neuronal degeneration and regeneration (Plasticity)
- Glial cells – functions and role
- Peripheral neuropathy
- Pain transmission and modulation
- Role of neurotransmitters in the brain-in health and disease
- Cell migration and axon guidance

In this course, students are expected to search for specific topics, collect recent publication and present written reports. Students are required to rotate among the faculties' laboratories which are engaged in neuroscience projects to learn more about recent technical advances being used in this field. Students will thus become acquainted with

the major theories, research and advances in neuroscience. Teaching sessions will include lectures, discussions and lab rotations.

0545-528: TISSUE CULTURE
CR: 2

Learn the principle of tissue culture and how to isolate, culture, and maintain different cells of the nervous system. The use of tissue culture approach to study the nervous system attempts to reduce the cellular complexity to various extents and to characterize the influence of extrinsic molecules on the cell population under study. The course will be given as one lecture (1 h) and one lab. (3 h) every week. The student may have to spend more time in the lab to feed and take care of the culture.

0545-529: ULTRASTRUCTURE AND SURFACE MORPHOLOGY
CR: 2

Basic techniques of transmission and scanning electron microscopy will be studied theoretically and applied practically by the students. Topics presented include all the necessary knowledge to prepare biological specimens and evaluate their ultrastructure and surface morphology. In addition, information on some special EM methods and recent developments in this field is given in lectures.

0545-597: THESIS
CR: 0

0545-598: THESIS
CR: 0

2000-599: THESIS
CR: 9